

DRAWINGS ATTACHED.



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## COMPLETE SPECIFICATION.

### Improvements relating to Pipe Couplings.

We, WHITEHOUSE INDUSTRIES LIMITED, a British Company, of Ferrybridge, Knottingley, in the County of York, and JOHN LEONARD KING, a British Subject, of the Company's address, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement ;

This invention relates to metal pipe couplings for hydraulic or pneumatic systems, which couplings include a male threaded body upon which is screwed a female threaded union nut to draw the adjacent pipe ends into fluid-tight connection.

The invention concerns the female screw-threaded union nut for couplings of this kind, and particularly for couplings which are liable to be loosened by vibrations as, for example, those used in the aircraft or automobile industries.

The chief object of the invention is to provide for such female threaded union nuts, self-locking means which will be so efficient and certain, that the unions will satisfy the very strict requirements of aircraft industry in which at present it is customary to wire the nut to the union through holes drilled in both to ensure that the nut cannot work loose. None of the many known forms of locking devices have been regarded as safe enough to replace this expensive and time-wasting locking device in the aircraft industry. Whilst it is well known to put transverse slots in nuts which are threaded throughout their bore and are to receive a screw-threaded bolt or the like and then to deform or "de-phase" the nut walls to give them a self-locking characteristic, the walls of these nuts have been of substantial thickness, but it has not heretofore been considered practically feasible to apply this principle to

female screw-threaded union nuts for pipe couplings, because the wall thickness of such union nuts is comparatively small and the bursting tendency when screwed on to the male threaded portion over the usual olive or nipple is considerable, and because most known forms of the self-locking device for nuts involve distortion of the threads at one end of the threaded portion which, if applied similarly to a female screw-threaded union nut of a pipe coupling, would prevent entry of the male threaded portion.

According to the present invention a female screw-threaded union nut has at its head end an unthreaded bore to accept a pipe and at its other end a threaded bore extending part way only through the nut and is formed in its threaded portion with a plurality of slots or saw cuts transverse to the axis of the nut and extending towards one another and far enough inwards to pass through the wall of the nut, the slots being subsequently partially closed before the nut is put into use so as to produce a permanent set or deformation whereby the screw threads on the two sides of each of said slots are out of their correct correlation, whilst the screw threads at the entrance and remain undisturbed. The term "partially closed" is used to mean that the opposite faces of each slot are brought to a touching or near-touching position at one point by the deforming or dephasing operation. When such a union nut is screwed upon the male threaded body of a coupling the slotted walls of its threaded portion are slightly elongated as the male thread forces the female thread to conform to it, thereby putting such slotted portion into a state of strain which acts to resist any tendency of the nut to work loose. Owing to the comparative thinness of the threaded walls of the union nut the number

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and nature of the slots or saw-cuts must be chosen so as to avoid undue weakening of the nut. The preferred arrangement of slots consists of two or more on each of two planes, those on one plane being angularly staggered or offset around the axis of the nut with respect to those on the other plane. There may be only two slots on each plane with 90° offset between the two sets of slots, and the slots are cut through the walls into the inner bore but may stop short of the axis.

However, various forms of slotting may be found suitable for the purpose of this invention. For example, the slots may be in planes not parallel to one another and/or not normal to the nut axis, and they may even be curved or otherwise formed or shaped (in which broad sense the term "planes" is herein used), all such variations being within the scope of the appended claims provided the strength of the nut walls remains sufficient for the particular purpose (i.e. pipe couplings) for which the nut is intended. In this connection it will be understood that the strength and self-locking standards stipulated for the aircraft industry are particularly high for safety reasons.

In order that the invention may be more clearly understood and readily carried into effect the same will now be more fully described with reference to and by the aid of the accompanying drawings which illustrate by way of example the preferred form of the invention as applied to what is known in the aircraft industry as an A.G.S. (i.e. Aircraft General Stores) coupling for use in aircraft. In these drawings:—

Figure 1 is an elevation of a female screw-threaded union nut which has been slotted and "de-phased";

Figure 2 is a similar view to Figure 1 but showing the nut turned through 90°;

Figure 3 is a transverse section through the nut of Figure 2 taken on the line III—III; and

Figure 4 is a longitudinal section through the ends of two pipes coupled by a union having the female portion constructed as shown in the previous Figures.

As shown in the drawings the female union nut has a hexagon head 1 with bore 2 to pass freely over a pipe, and a larger annular recess 3 furnishing a shoulder 4. The body portion 5 is internally threaded at 6. Through the screw-threaded part of the walls of the body portion 5 are cut two pairs of straight slots 7, 7 and 8, 8 which extend into the inner bore but stop short of the axis. The two slots 7, 7 lie in one plane and are diametrically opposite to one another, being separated by bridge pieces 7x. The two slots 8, 8 are similarly arranged but in a different plane and separated by bridge pieces 8x, the two pairs being offset angularly at 90° to one another as clearly shown in Figure 3. These

slots are partially closed by "de-phasing," that is by applying sufficient axial pressure to shorten the overall length of the nut and produce the permanent set or deformation already described whilst leaving the threads at the entrance end undisturbed.

The Figure 4 shows such a female threaded nut screwed onto a male portion 10 to clamp the belled ends of two pipes 11, 12 between an olive or nipple 13 on the inside and a collar or ring 14 and the male portion 10 as is well known in such couplings. It will be seen from this Figure that the slots 7, 7 and 8, 8 have been opened by the threads of the male portion 10 elongating the outer slotted end part of the walls of the portion 5, and that the slots all lie around and are therefore supported by the male portion 10 in the assembled coupling whilst the outermost threads, being left undisturbed by the "de-phasing," form a lead-in for the entrance of the male portion.

By using such an arrangement of slots which are cut through the walls into the inner bore but stop short of the axis, the locking action is made very effective by being spread evenly around the periphery of the male portion 10, thereby offering a strong resistance to any slackening tendency under vibration. Also this arrangement of slots minimises their weakening effect on the walls of the union nut which is an essential requisite in many instances.

The improved union nuts may be made of any suitable metal such as light alloys.

#### WHAT WE CLAIM IS:—

1. A self-locking female screw-threaded union nut of a metal pipe coupling which nut has at its head end an unthreaded bore to accept a pipe and at its other end a threaded bore extending part way only through the nut, and is formed in its threaded portion with a plurality of slots or saw cuts transverse to the axis of the nut and extending towards one another and far enough inwards to pass through the wall of the nut, the slots being subsequently partially closed before the nut is put into use so as to produce a permanent set or deformation whereby the screw threads on the two sides of each of said slots are out of their correct correlation whilst the screw threads at the entrance end remain undisturbed.

2. A self-locking union nut according to Claim 1, wherein the arrangement of slots consists of two or more on each of two planes, those on one plane being angularly staggered or offset around the axis of the nut with respect to those on the other plane.

3. A self-locking union nut according to Claim 2, having two diametrically opposed slots formed on each of the two planes, those on one plane being offset from those on the other plane by 90° around the axis of the nut.

4. A self-locking union nut according to

any one of the preceding claims, wherein the slots extend into the inner bore but stop short of the axis.

- 5 A self-locking female screw-threaded union nut of a metal pipe coupling, constructed and arranged as herein described with reference to and as illustrated in the accompanying drawings.

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Reference has been directed in pursuance of Section 9, subsection (1), of the Patents Act, 1949, to Patent No. 738,374.

# PROVISIONAL SPECIFICATION.

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15 This invention relates to metal pipe couplings for hydraulic or pneumatic systems, which couplings include a male threaded body upon which is screwed a female threaded union to draw the adjacent pipe ends into fluid-tight connection.

20 The invention concerns the female threaded union for couplings of this kind, and particularly for couplings which are liable to be loosened by vibrations as, for example, those used in the aircraft or automobile industries.

25 The chief object of the invention is to provide for such female threaded unions, self-locking means which will be so efficient and certain, that the unions will satisfy the very strict requirements of aircraft industry in which at present it is customary to wire the union to the body through holes drilled in both to ensure that the union cannot work loose. None of the many known forms of locking devices have been regarded as safe enough to replace this expensive and time-wasting locking device in the aircraft industry.

40 According to the present invention, a female threaded union has formed in its threaded portion a plurality of slots or saw cuts transverse to the axis of the union and extending towards one another and far enough inwards to pass through the wall of the union, the slots being subsequently partially closed before the union is put into use so as to produce a permanent set or deformation whereby the screw threads on

the two sides of each of said slots are out of their correct correlation. When such a union is screwed upon the male threaded body of a coupling the slotted walls of its threaded portion are slightly elongated as the male thread forces the female thread to conform to it, thereby putting such threaded portion into a state of strain which acts to resist any tendency of the union to work loose.

50 Owing to the comparative thinness of the threaded walls of the union the number and nature of the slots or saw-cuts must be chosen so as to avoid undue weakening of the union. The preferred form of slots consists of two or more on each of two planes, those on one plane being angularly staggered or offset around the axis of the union with respect to those on the other plane. There may be only two slots on each plane with 90° offset between the two sets of slots.

70 By using such an arrangement of slots which are cut through the walls into the inner bore but stop short of the axis, the locking action is made very effective by being spread evenly around the periphery of the body on which the union is threaded, thereby offering a strong resistance to any slackening tendency under vibration. Also this arrangement of slots minimises their weakening effect on the walls of the union.

80 Other forms of slotting may be found suitable for the purpose and the slots may be in planes not parallel to one another and/or not normal to the union axis, and they may even be curved or otherwise formed or shaped.

85 The improved unions may be made of any suitable metal such as light alloys.

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